

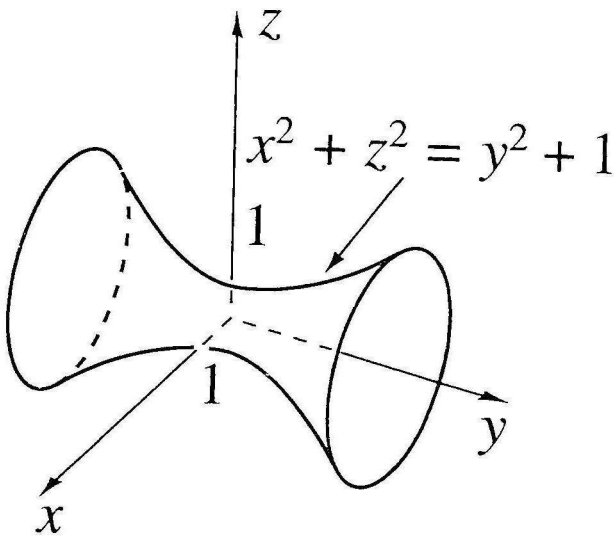
QUIZ #1 – Solutions
Each problem is worth 5 points

1. A point $P(x, y, z)$ is equidistant from $(-3, 0, 4)$ and $(2, 1, 5)$ if and only if

$$(x+3)^2 + (y-0)^2 + (z-4)^2 = (x-2)^2 + (y-1)^2 + (z-5)^2$$

This equation reduces to $10x + 2y + 2z = 5$ and describes a plane.

2.



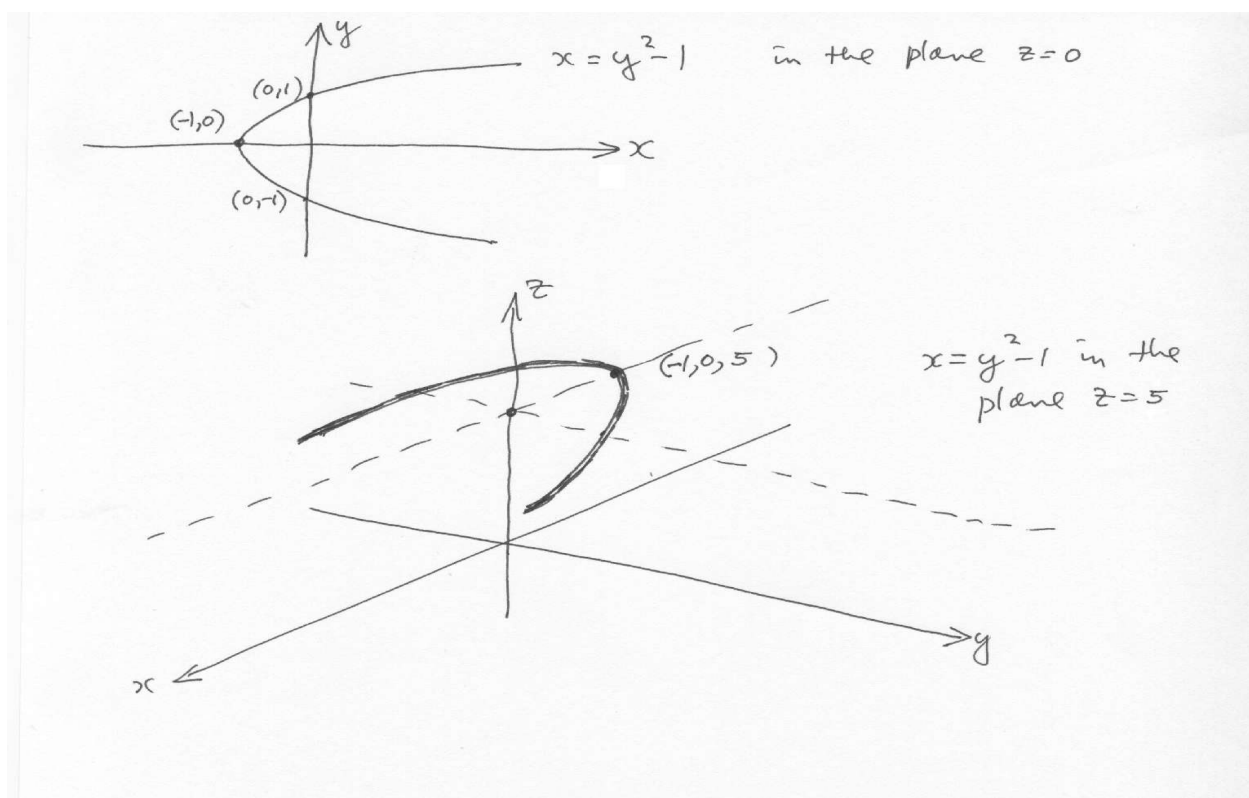
3. If \mathbf{v} has constant length, then $\mathbf{v} \cdot \mathbf{v} = |\mathbf{v}|^2 = \text{constant}$.

Differentiation with 12.59b gives

$$0 = (d\mathbf{v}/dt) \cdot \mathbf{v} + \mathbf{v} \cdot (d\mathbf{v}/dt) = 2 (\mathbf{v} \cdot d\mathbf{v}/dt)$$

But this implies that \mathbf{v} and $d\mathbf{v}/dt$ are perpendicular.

4. Since $x = t^2 - 1$, $y = t$, $z = 5$ we have $x = y^2 - 1$ which is a parabola in the x - y plane. The required curve is a parabola in the plane $z = 5$.



5.

Since this is a straight line segment from $(7, 0, 2)$ to $(2, 1, 6)$, its length is

$$\sqrt{5^2 + (-1)^2 + (-4)^2} = \sqrt{42}.$$

